



Air, Vapor & Weather Barriers

- Weather “barriers”—Housewraps, drainage planes and rain screens
- Vapor diffusion and vapor retarders



Information provided by the International Building Code (IBC) and the International Residential Code (IRC).



Housewrap Qualities

- Provides a drainage layer
 - If properly installed and detailed
- All sheathing papers/wraps:
 - Reduced effectiveness from exposure to raw cedar, redwood, or cement stucco
 - Backprime or use rain screen



Information provided by the International Building Code (IBC) and the International Residential Code (IRC).

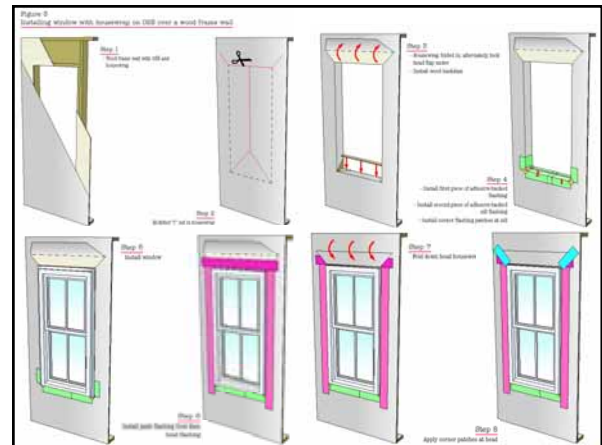


Photo Courtesy Dave Ricketts, ©RDH Building Engineering Ltd.



Window Details for Drainage

Journal of Light Construction, March 2003

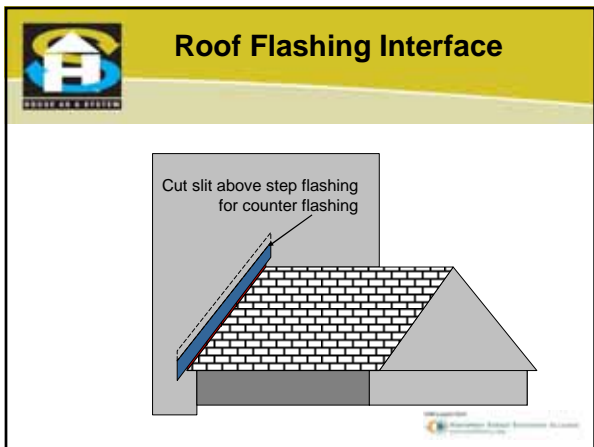


www.buildingscience.com

- Click on "Homeowner resources"

www.eeba.org

- Water Management Guide



Quotes:

- “Plan your exterior details as if there is a worldwide shortage of caulk. Assume you don’t have any.”
– Mark LaLiberte



Vapor Diffusion

- Water vapor moves through *solid* materials
 - Moves towards cold, dry
- “Vapor pressure”
 - Pushes out in the winter
 - Pushes in in the summer

Source: ASHRAE Fundamentals 1997



Energy Code

2004 Supplement to IECC: Moisture Control

In all frame walls, floors, and ceilings not ventilated to allow moisture to escape, an approved vapor retarder having a maximum rating of 1.0 perm, ... shall be installed on the warm-in-winter side of the thermal insulation

Source: ASHRAE Fundamentals 1997



Permeance of Materials

• Housewraps	30-60
• Gypsum board	50
• Paints	0.5-10
• Extruded polystyrene	1 (@1")
• 15-lb felt paper	1.0 - 4.0
• Exterior plywood / OSB	0.8
• Kraft facing on batt	0.4
• Polyethylene (6-mil)	0.06
• Aluminum foil (1-mil)	0.0

Source: ASHRAE Fundamentals 1997

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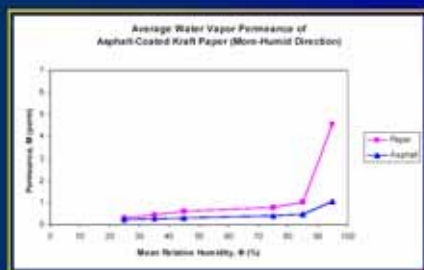
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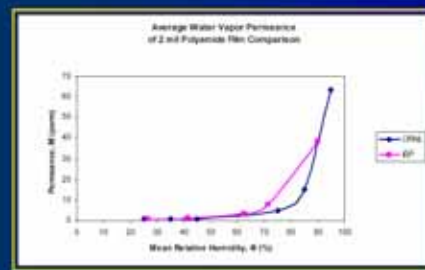
Asphalt Coated Kraft Paper



Certainteed


More on Smart Materials in Vapor Control
2004 Vapor Barrier Expert Meeting
Building America June 14, 2004

Smart Vapor Retarder




Certainteed


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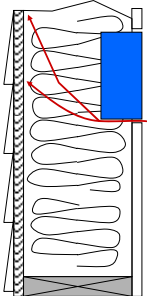
Air barriers

- What do they have to do with moisture?







Interior and Exterior Air Barriers

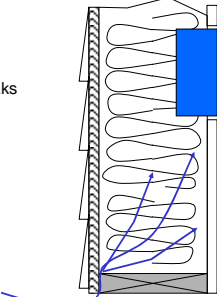


Interior air leaks allow warm humid air to reach the exterior sheathing







Interior and Exterior Air Barriers`




Exterior air leaks allow wind washing and chilling of interior vapor barrier





Preventing Condensation

- Humidity control
- Limit air flow
- Keep vapor retarder warm w/ proper insulation
- Exterior rigid foam board
 - Keeps sheathing warm





The Oregonian

1993-1994

Builders under siege

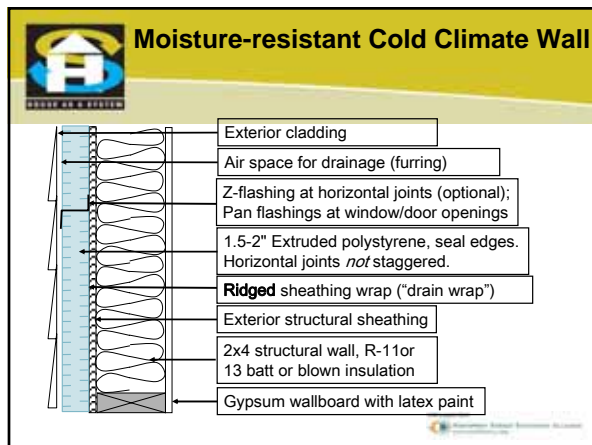
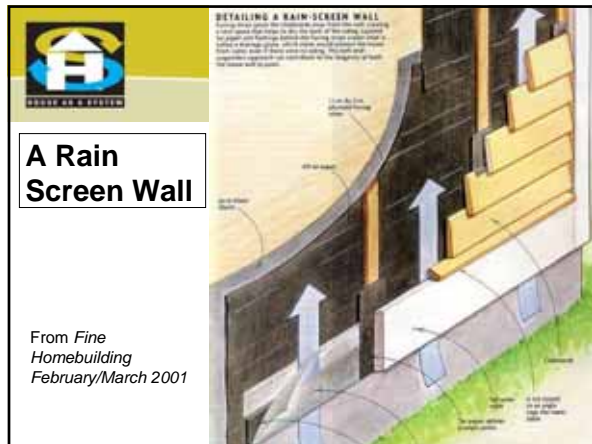
Home contractors in Oregon seek protection from consumer suits, but the real need is better construction

The Oregonian, a major newspaper in the state, has published a series of articles in recent months that have been critical of the construction industry. The articles have focused on the problems of home builders, particularly the issue of consumer protection. The articles have been widely read and have caused a great deal of concern among the building industry.






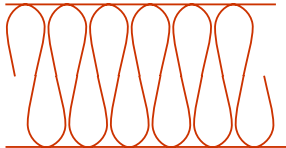










HOUSE AS A SYSTEM
 Home Building Solutions Workshop

Insulation




Insulation Materials


- Fiberglass
- Cellulose
- Foam
- Cotton
- Wool




Installation Methods


- Loose fill
- Batts and blankets
- Blow-in-systems: BIBS, Spider
- Open cavity spray




Energy Code Corner

IECC 2003 Section 102.4
Insulation installation:

- “Roof-ceiling, floor, wall cavity insulation and duct distribution systems insulation shall be installed in a manner that permits inspection of the manufacturer’s R-value identification mark.”





Energy Code Corner



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Center for Energy Systems Research
Energy Code Corner



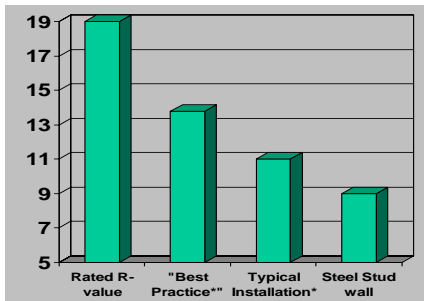
ENERGY STAR® Requirements

- Fiberglass batts must be installed to manufacturers specifications:
 - Fully lofted
 - Completely fill framing cavity
 - No voids or gaps
 - Cut to fit neatly around all obstructions
- Flanges of faced batts must be stapled over framing members
- Vapor retarder required as per building code

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Center for Energy Systems Research
ENERGY STAR



Fiberglass Batts (Real World)



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Energy Code Corner



Why is it So Bad?

- The gaps and spaces dominate the heat loss
 - No matter how much insulation you pile up next to a gap, the heat loss through the gap is not reduced at all
- The larger the initial R-value, the greater the effect

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Typical installations...



Typical installations...



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Typical installations...



Informational
Knauf Insulation
Knauf Insulation
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Typical installations...



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Typical installations...



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Typical installations...



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Correct Installation



Informational
Knauf Insulation
Knauf Insulation
Knauf Insulation



Loose Fill Fiberglass Methods

Blow-in-Blanket System (BIBS)

Spider

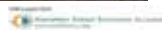
- Loose fill fiberglass installed behind netting stapled over framing members
- Installed R-value dependent on density
- Typical for a 2x6 wall is R-21 to R-23



Blow-in-Blanket (BIBS) Fiberglass



Spider



Cellulose Insulation Methods

- Blown in open attics
 - Desired R-value achieved by installing the number of bags specified by the manufacturer (by square feet)
- Dense-Pack systems (similar to BIBS)
- Open Cavity Damp Spray
 - Typical for a 2x6 wall is R-21 to R-23

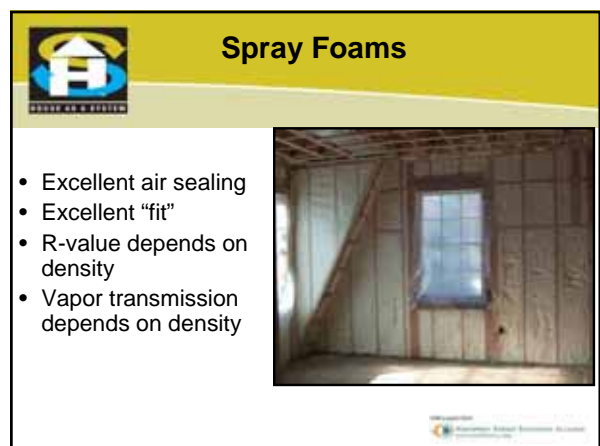
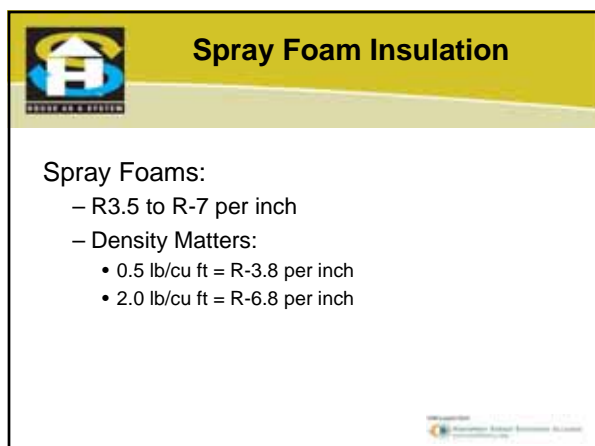
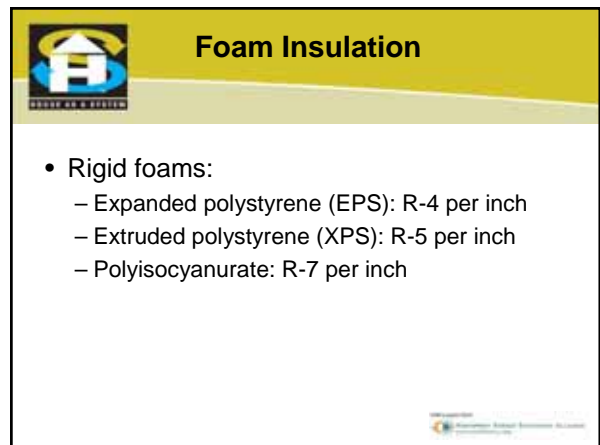


Blown Cellulose Insulation



Damp spray cellulose







Targeted Spray Foam

- Band joist area
- Rafter / ceiling joist
- Wall intersection
- Difficult areas
 - Dormers
 - Odd framing bays
 - Unvented roofs
- Ducts in attic



Spray Foam



Hybrid Spray Foam

- 2 – 3 inches of foam
 - Air sealing
 - High R-value
 - Tight spots
 - Moisture protection
- Fiberglass
 - cheap



Spray-in Insulation Weakness



It's so easy, even he can do it!

